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ABSTRACT

Research results transitioned to applications are one of the primary outputs from the National Oceanic and Atmospheric Administration's (NOAA's) science. NOAA's Line Offices have traditionally been responsible for ensuring the quality and progress of transitions. However, there has been no systematic, NOAA-wide monitoring of projects, and often transitions have been dealt with individually on an ad hoc basis. As a result, NOAA had not developed a comprehensive performance metric for its transitions.

In response to this need, in Fiscal Year (FY) 2009, NOAA's Office of Oceanic and Atmospheric Research (OAR) decided to develop a pilot performance measure focused on transitions between OAR and NOAA's National Weather Service. The metric was developed as part of a new suite of performance measures included under the Government Performance and Results Act. This pilot performance measure and project monitoring associated with it, were implemented on a trial basis from FY 2008 through FY 2011. This technical memorandum documents the development process, challenges, assumptions, results, and lessons learned from the evaluation of this measure.

1. **BACKGROUND**

As a science, service, and stewardship agency, NOAA has long recognized the importance of ensuring that its research and development projects improve society's relationship with the natural environment. From weather radars to oceanic buoys to fishing stock assessments, NOAA research has enhanced our understanding of the world in which we live. Application of such scientifically-based knowledge improves people's lives. Effective and efficient transitioning of NOAA research to applications (R2A) is a critical process that helps ensure NOAA's products are used effectively to benefit society.

NOAA recognized that tracking and reporting on such transitions would improve the visibility and transparency of these activities to the Administration and the public. Therefore, NOAA issued its first policy and set of procedures to identify and transition results to applications in 2005 (NOAA Administrative Order [NAO] 216-105; revised 2008¹). NOAA defines transition projects as “a collective set of activities necessary to transfer a research result, or collection of research results, to operational status or to an information service” (NAO 216-105). Many NOAA transitions of research to applications occur between NOAA's Office of Oceanic and Atmospheric Research (OAR) and the National Weather Service (NWS). However, there was never comprehensive information available on the number and types of these transitions. In 2008, questions remained about the efficiency of R2A transitions between OAR and NWS. So, the NOAA Deputy Undersecretary for Operations requested that OAR,

¹ http://www.corporateservices.noaa.gov/ames/administrative_orders/chapter_216/216-105.pdf

working with NWS, develop a capability to account for the OAR-to-NWS transition projects and determine how many of these projects were transitioned in FY2008. As a result, databases with limited fields were developed to capture information on transition projects in each Line Office. The databases allowed the offices to conduct a transition portfolio analysis, which assessed the current state of the transition portfolio and identified issues which required further monitoring or attention. The databases were extended in FY2009 to include all projects in the OAR and NWS portfolios.

To further improve the transparency of R2A activities and elevate the visibility of these important activities, OAR decided in Fiscal Year (FY) 2009, with the consent of NOAA's Chief Financial Officer, to establish a performance measure for research to application transitions under the Government Performance and Results Act (GPRA²). GPRA measures need to be standardized and kept constant to collect robust data and assess trends over time. Since it would be challenging to collect data for, test, and evaluate this new measure, OAR established it as a pilot measure. This would provide the flexibility to learn from the development of this measure, modify it, or terminate it at any time.

Since NOAA had already established some tracking mechanisms for OAR-to-NWS transitions during FY 2008, OAR initiated its pilot measure using only OAR-to-NWS transitions. OAR assumed this subset of data would be easier to monitor and provide more robust results. The pilot sought to address the following questions: What is the efficiency of project transition between OAR and NWS? What issues exist for annually

² <http://www.whitehouse.gov/omb/mgmt-gpra/index-gpra>

calculating a robust measure of transition efficiency? How can those issues be resolved to establish a NOAA-wide GPRA measure for transitions? The pilot measure was calculated using data from FY 2008-2011, and then terminated in order to establish a broader, comprehensive, and more reproducible NOAA transition performance measure.

2. **METHODS**

To help develop a transition performance metric, OAR relied on project information collected in databases previously used to analyze the OAR and NWS portfolios of activities. These databases captured generic project information (name, summary, point of contact), a funding profile, and transition information. Transition projects were partially defined by their "stage of readiness" for transition to NWS. These expected timelines to transition included:

1. Operational: Transitioned to operations during the FY;
2. Mature: Ready, but not transitioned during the FY;
3. Near-term: 1-2 years to transition;
4. Mid-term: 3-5 years to transition;
5. Long-term: greater than 5 years to transition; and
6. Concept: time horizon to transition not yet determined.

Identification of specific projects to include in the database, and their stage of readiness, was left up to the individual laboratory, program, office, center, or region. As a result, OAR had to reconcile differences between the OAR and NWS databases (e.g., names and granularity (size) of projects) to ensure that each of the two Line Offices was referring to the same projects and that the transition status of the projects was mutually agreed upon. This reconciliation was not an easy task and was required each year.

When initially defining a performance metric, OAR's Office of the Chief Financial Officer (OCFO) decided the best information about transition performance could be conveyed by an efficiency metric, rather than simply a count of successful transitions. OCFO anticipated that the Department of Commerce (DOC) and the Office of Management and Budget (OMB), the agencies that would review the metric, would want to know both how many projects were transitioned and how many projects were in line for transition. The metric was thus defined as the proportion of projects transitioned from OAR to NWS in a given FY. The total number of projects in line for transition in a given FY would represent the denominator of the efficiency measure, while those projects transitioned in the same FY would represent the numerator. To improve the stability of the measure, the proportion was reported as a running average of two consecutive years. Using the initial two years of project data (FY2008-2009), a target efficiency of 16% was established for FY2010 and 2011.

There were two primary challenges to implementing this performance measure definition. First, the NOAA definition of transition project left open the question of granularity (i.e., project size or grouping of multiple transition deliverables) which could increase the

uncertainty of the measure. To deal with this issue, headquarters staff allowed the leadership of the OAR laboratories and programs to enter projects into the database that they felt were transition projects to NWS. Staff then iterated and revised the scope of these projects with the laboratory and program leadership to improve the consistency of project granularity across the portfolio.

Second, from the total database of projects, a decision had to be made on which projects were in line for transition and hence would be included in the measure. OAR decided to exclude “concept” projects and “long-term” projects as they are likely to be redefined, terminated, merged, or divided over time, resulting in a poor, inaccurate measure of transition efficiency. Rather, OAR concluded that only projects with a timeline to transition of mid-term or less (≤ 5 years) should be included. The expectation was that this would create the most stable and accurate denominator.

Over the FY2008-2011 time frame, OAR and NWS collected project information in slightly different ways. Both offices collected project data in a transition projects database in FY2008 and an expanded overall research and development (R&D) project database in FY2009 as previously described. NWS continued collecting overall R&D data in a similar manner in subsequent years. OAR suspended its project database in FY 2010, instead focusing its efforts on a long term solution for R&D projects across NOAA. Since limited information on projects was needed to calculate the transition performance measure, OAR Leadership decided to conduct a data call to its laboratories and programs for FY2010-2011 information. This request collected project titles, points of contact, and

timelines to transition to NWS for those projects with a mid-term time frame or shorter. The results of this call provided the two final years of data for the pilot performance measure.

3. **RESULTS**

The number of projects transitioned from OAR to NWS ranged from 12 in FY2008 to 29 in FY2010, while the total number of projects planned for transition varied from 84 in FY2008 to 143 in FY2010. As a result, the performance measure calculations during the four pilot years were (to the nearest 1%):

FY2008: 14%

FY2009: 19%

FY2010: 20%

FY2011: 19%

The original targets set for FY2010-2011 were 16% based on the data from FY2008-2009. The target was less than the efficiency in FY2009 as funding for transitions was expected to decrease.

At the laboratory and program level, there was considerable variability in the number of transition projects and successful transitions. This result is not surprising since the

laboratories and programs have different research missions and, therefore, place different degrees of emphasis on projects directed toward NWS operational needs. Additionally, the statistics in individual laboratories and programs were often based on small numbers, and therefore can result in relatively large variability. The table below illustrates the variability in the “raw” data for FY2010 and 2011. The data between these two years were less variable than between FY2008 and 2009.

FY2010-11 Transition Projects to the NWS by OAR Lab and Program
(5 yrs or less transition horizon)

<i>Lab/Program</i>	<i>Transition Projects</i>	<i>FY2010</i>	<i>FY2011</i>
AOML	Total	14	11
	# Transitioned	3	1
ARL	Total	8	5
	# Transitioned	4	5
PSD	Total	17	17
	# Transitioned	0	1
GFDL	Total	2	2
	# Transitioned	0	0
GLERL	Total	7	7

GSD	# Transitioned	0	0
	Total	34	28
NSSL	# Transitioned	6	1
	Total	42	26
OWAQ	# Transitioned	16	11
	Total	15	15
PMEL	# Transitioned	0	3
	Total	4	4
GRAND TOTALS	TOTAL	143	115
	TOTAL # TRANSTIONED	29	22

4. **DISCUSSION**

Calculating this performance measure presented several challenges. For instance, project granularity and time to transition estimates changed from year to year based on changing interpretation by laboratory, program or project leaders. This learning curve challenged the usefulness of this metric, particularly in early years. Yet, at approximately 20% efficiency for FY 2009 – 2011, this measure was somewhat stable during later years. The

higher efficiencies relative to FY 2008 were likely due to improved group consensus on project granularity and a better understanding of the definition of transition projects by those involved. Additionally, the stability was probably enhanced by using a 2-year running average. Thus, an important lesson learned from this process was that crisp definitions and extensive training and discussion among all reporting parties is needed to ensure consistency in reporting and results. In particular, once a standard process is established, quality analysis/quality control and training of new participants is necessary.

Another important lesson was consistency in data reporting can be improved by establishing a standard database and protocol. Data collection was more ad hoc during FY2010-2011, because a current database of OAR research projects was unavailable. As such, laboratories and programs were asked to develop lists of transition projects using whatever resources were at hand rather than a standard system with consistent annual input. A database that is updated annually as projects progress would create a much more systematic and reproducible process for calculating the performance measure.

Additionally, data could be quality controlled at the point of project entry/update as opposed to when a particular performance measure needs to be calculated.

While this transition measure was primarily developed by OAR input, a true transition requires both the development and delivery of a product or service and the subsequent acceptance and implementation of that product or service by the receiving party. During the first two years of the pilot, OAR and NWS carefully crosschecked transition projects and readiness between their databases to ensure both agreed on the transition and its

timeframe. Such a crosscheck was not possible during the final two years, as full project data were not available in an OAR database. A NOAA-wide database that captures appropriate partnerships for such research projects would help to document agreement between deliverer and recipient. Additionally, this would improve the performance metric by moving away from a transition delivery measure toward a joint measure between two Line Offices.

In 2011, OMB budget examiners reviewed OAR's efforts to develop a pilot measure, and came to similar conclusions about the challenges associated with it. However, they felt such an effort to calculate a transition performance measure based on efficiency represented a good beginning. They noted the importance of transition research to the NOAA mission and encouraged OAR to continue development of a more inclusive transition measure.

Having learned a number of lessons from the pilot, OAR terminated it at the end of FY 2011. OAR is now considering broader, NOAA-wide transition measures that adhere to the new requirements in NAO 216-115: Strengthening NOAA's Research and Development Enterprise³. This order specifies the need for the evaluation of the quality of performance measures, such as the number of peer-reviewed publications and citations in support of a transition projects. It also includes a requirement for technical readiness levels (TRLs) in NOAA, the establishment of which would create an alternate method for calculating a transition metric. TRLs would provide a formal system to assign the state of transition readiness, as opposed to an ad hoc estimate of time to transition as done

³ http://www.corporateservices.noaa.gov/ames/administrative_orders/chapter_216/216-115.html

through the database and used in the pilot measure. Such a metric could evaluate either the rate of project advancement through technical readiness levels or the number of successfully completed transitions relative to the corporate balance of projects in the various TRLs. Because this system would have a more formalized structure for determining transition projects and assigning levels, it could reduce the impact of the two main issues of the pilot: project definition and granularity. This system is currently under discussion by NOAA's Line Office Transition Managers who will provide recommendations to NOAA and a revision of NAO 215-105.

5. **Acknowledgements**

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